

***What Is Claimed Is:***

1. A ball grid array (BGA) package, comprising:

a stiffener/heat spreader;

5 a substrate that has a first surface and a second surface, wherein said substrate has a central window-shaped aperture that extends through said substrate from said first substrate surface to said second substrate surface, wherein said first substrate surface is attached to a surface of said stiffener/heat spreader, wherein a portion of said stiffener/heat spreader is accessible through said central window-shaped aperture;

10 an IC die that has a first surface and a second surface, wherein said first IC die surface is mounted to said accessible portion of said stiffener/heat spreader; and

a drop-in heat spreader that has a surface that is mounted to said second IC die surface.

15 2. The package of claim 1, further comprising:

a plurality of solder balls attached to said second substrate surface.

3. The package of claim 1, wherein said drop-in heat spreader is configured to dissipate heat generated by said IC die.

20 4. The package of claim 1, wherein said second IC die surface includes a contact pad, further comprising:

a wire bond that couples said contact pad to said drop-in heat spreader.

5. The package of claim 4, wherein a second surface of said drop-in heat spreader is configured to be attached to a printed circuit board.

6. The package of claim 5, wherein said contact pad is a ground contact pad, wherein said drop-in heat spreader operates as a ground plane.

5 7. The package of claim 4, wherein said first surface of said drop-in heat spreader is planar, wherein said drop-in heat spreader has a second planar surface, wherein said first and said second planar surfaces are substantially parallel to each other, wherein said drop-in heat spreader has a ridge around at least a portion of its circumference such that an area of said first planar surface is greater than that of said second planar surface.

10 8. The package of claim 7, wherein said wire bond attaches to said ridge of said drop-in heat spreader.

15 9. The package of claim 1, wherein said stiffener/heat spreader includes a central cavity in said stiffener/heat spreader surface, wherein said central cavity forms at least a portion of said accessible portion of said stiffener/heat spreader, wherein said IC die is mounted to said stiffener/heat spreader in said central cavity.

10. The package of claim 1, wherein said stiffener/heat spreader surface is substantially planar, wherein said accessible portion of said stiffener/heat spreader is centrally located on said stiffener/heat spreader surface.

20 11. The package of claim 1, wherein said IC die is mounted to said stiffener/heat spreader with a first epoxy, and wherein said drop-in heat spreader is mounted to said IC die with a second epoxy.

12. The package of claim 1, wherein an area of said second IC die surface is greater than an area of a surface of said drop-in heat spreader, wherein

said drop-in heat spreader is configured to mount to the center of said second IC die surface.

13. The package of claim 1, wherein said IC die and said drop-in heat spreader are encapsulated.

5 14. The package of claim 1, wherein said IC die and a portion of said drop-in heat spreader are encapsulated, wherein a second surface of said drop-in heat spreader is exposed.

10 15. The package of claim 14, wherein said drop-in heat spreader includes a circumferential surface between said first and said second drop-in heat spreader surfaces, wherein said circumferential surface is at least partially exposed.

16. The package of claim 1, wherein said substrate is a tape substrate.

17. The package of claim 1, wherein said stiffener/heat spreader and said drop-in heat spreader have the same thermal expansion coefficient.

15 18. A method of assembling a ball grid array (BGA) package, comprising the steps of:

providing a substrate that has a first surface and a second surface, wherein the substrate has a central window-shaped aperture that extends through the substrate from the first substrate surface to the second substrate surface;

20 providing a stiffener/heat spreader;

attaching a surface of the stiffener/heat spreader to the first substrate surface, wherein a portion of the stiffener/heat spreader is accessible through the central window-shaped aperture;

mounting a first surface of an IC die to the accessible portion of the stiffener/heat spreader; and

mounting a surface of a drop-in heat spreader to a second surface of the IC die.

5           19.    The method of claim 18, further comprising the step of:  
attaching a plurality of solder balls to the second substrate surface.

20.    The method of claim 18, wherein the second IC die surface includes a contact pad, further comprising the step of:  
coupling the contact pad to the drop-in heat spreader with a wire bond.

10           21.    The method of claim 20, further comprising the step of:  
configuring a second surface of the drop-in heat spreader to be attached to a printed circuit board.

15           22.    The method of claim 21, wherein the contact pad is a ground contact pad, further comprising the step of:  
coupling the ground contact pad to the drop-in heat spreader with the wire bond, wherein the drop-in heat spreader operates as a ground plane.

20           23.    The method of claim 20, wherein said drop-in heat spreader mounting step comprises the step of:  
providing a drop-in heat spreader that has a first planar surface, wherein the drop-in heat spreader has a second planar surface, wherein the first and the second planar surfaces are substantially parallel to each other, wherein the drop-in heat spreader has a ridge around at least a portion of its circumference such that an area of the first planar surface is greater than that of the second planar surface.

24. The method of claim 23, wherein said contact pad coupling step comprises the step of:  
attaching the wire bond to the ridge of the drop-in heat spreader.

5 25. The method of claim 18, wherein said stiffener/heat spreader providing step comprises the step of:  
forming a central cavity in the stiffener/heat spreader surface, wherein the central cavity forms at least a portion of the accessible portion of the stiffener/heat spreader.

10 26. The method of claim 25 wherein said IC die first surface mounting step comprises the step of:  
mounting the IC die in the central cavity.

15 27. The method of claim 18, wherein said drop-in heat spreader mounting step comprises the step of:  
providing a drop-in heat spreader that is substantially planar, wherein the accessible portion of the stiffener/heat spreader is centrally located on the substantially planar stiffener/heat spreader surface.

20 28. The method of claim 18; wherein said IC die first surface mounting step comprises the step of:  
mounting the IC die first surface to the stiffener/heat spreader with a first epoxy, wherein the drop-in heat spreader is mounted to the IC die with a second epoxy.

25 29. The method of claim 18, wherein an area of the second IC die surface is greater than an area of a surface of the drop-in heat spreader, further comprising the step of:  
configuring the drop-in heat spreader to mount to the center of the second

IC die surface.

30. The method of claim 18, further comprising the step of:  
encapsulating the IC die and the drop-in heat spreader.

5 31. The method of claim 30, wherein said encapsulating step  
comprises the step of:  
exposing a surface of the drop-in heat spreader.

32. The method of claim 31, wherein said exposing step comprises the  
step of:  
10 exposing at least a portion of a circumferential surface of the drop-in heat  
spreader.

33. The method of claim 18, wherein the substrate is a tape substrate,  
wherein said substrate providing step comprises the step of:  
providing the tape substrate.

15 34. The method of claim 18, further comprising the step of:  
matching a thermal expansion coefficient of the stiffener/heat spreader to  
the thermal expansion coefficient of the drop-in heat spreader.

35. A system for assembling a ball grid array (BGA) package,  
comprising:

20 means for providing a substrate that has a first surface and a second  
surface, wherein the substrate has a central window-shaped aperture that extends  
through the substrate from the first substrate surface to the second substrate  
surface;

means for providing a stiffener/heat spreader;

means for attaching a surface of the stiffener/heat spreader to the first

substrate surface, wherein a portion of the stiffener/heat spreader is accessible through the central window-shaped aperture;

means for mounting a first surface of an IC die to the accessible portion of the stiffener/heat spreader; and

5 means for mounting a surface of a drop-in heat spreader to a second surface of the IC die.

36. The system of claim 35, wherein the substrate is a tape substrate, wherein said substrate providing means comprises:

means for providing the tape substrate.